Section 7

Part C

Front Axle - 4 Wheel Drive (Dana Make)

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Table of Contents

Operation No.	Description	Page No.
———	Specification	7C - 3
———	General description	7C - 4
7C.1	Wheel alignment and steering stops - adjust	7C - 5
7C.2	Track rod and ball joint - removal	7C - 5
7C.3	Front axle - removal	7C - 6
7C.4	Planetary carrier - removal	7C - 7
7C.5	Hub oil seal- removal	7C - 8
7C.6	Planetary carrier and hub - overhaul	7C - 12
7C.7	Swivel housing and pins - removal	7C - 14
7C.8	Drive shaft and oil seals - removal	7C - 16
7C.9	Drive shaft - overhaul	7C - 17
7C.10	Pinion oil seal - removal	7C - 18
7C.11	Differential assembly - removal	7C - 20
7C.12	Differential assembly - overhaul	7C - 20
7C.13	Crownwheel and pinion - overhaul	7C - 23
7C.14	Steering ram - removal	7C - 26
7C.15	Steering ram - overhaul	7C - 27

Specification - Front Axle

Axle type - MF2625 tractors	...	AG 65 SDN - Standard (no diff lock)
Camber angle	...	1°
Toe-in	...	0 - 0.196 inch (0 - 5mm)
Axle reduction ratio	...	2.7692:1
Crownwheel and pinion	...	13 x 36 teeth
Pinion setting dimension	...	3.582 inch (91mm)
Pinion bearing pre-load	...	17.701 lbf.inch (2Nm)
Crownwheel and pinion backlash	...	0.0051 - 0.007 inch (0.13-0.18mm)
Differential bearing pre-load	...	With zero end-float tighten bearing nut three notches.
Epicyclic reduction ratio	...	4.1538:1
Swivel pin pre-load	...	0.006 - 0.0098 inch (0.15 - 0.25mm)
Oil capacity:		
Hub	...	0.052 gal (0.20 liter) each side
Axle	...	0.990 gal (3.75 liter)
Special tools		
MF.195C	...	Bearing remover/replacer
MF.451B	...	Axle swivel pin remover
MF.480	...	Pinion nut wrench
MF.481	...	Hub nut wrench
MF.482	...	Steering ram wrench
MF.488	...	Four-wheel drive hub puller
MF.493	...	Hub seal installer
MF.495	...	Planetary ring gear replacer
MF.496	...	Wear ring installer
FT.4062A	...	Pinion pre-load gauge
Bolt torques		
Track rod locknuts	...	83 lbf.ft (112 Nm)
Ball joint nuts	...	78 lbf.ft (106 Nm)
Wheel nuts	...	199 lbf.ft (270 Nm)
Planetary carrier countersunk screws	...	35 lbf.ft (47 Nm)
Hub retaining nuts	...	313 lbf.ft (425 Nm)
Pivot pin cap bolts	...	52 lbf.ft (70 Nm)
Pinion nut	...	218 lbf.ft (295 Nm)
Differential case bolts	...	52 lbf.ft (70 Nm)
Crownwheel bolts	...	112 Nm (83 Nm)
Differential bearing cap bolts	...	105 lbf.ft (143 Nm)
Steering ram cap screws	...	79 lbf.ft (107 Nm)

GENERAL DESCRIPTION - FRONT AXLE

The Massey Ferguson four wheel drive front axle is driven by a drive shaft along the left-hand side of the tractor from a transfer gearbox bolted to the side of the rear center housing. The transfer gearbox contains the reduction gears and clutch to control the engagement and disengagement of the front axle.

The front axle has the crownwheel and pinion and differential mounted on the left-hand side of the axle to align with the drive shaft making it a side-drive arrangement.

The drive is taken through a standard crownwheel and pinion and differential arrangement. The crownwheel is mounted on the left-hand side of the differential. The differential contains a cross with four differential bevel gears, these mesh with two side bevel gears to which the inner ends of the drive shafts splined.

The drive shafts transmit the power through double universal joints at the steering pivot to the epicyclic reduction units in the front wheels. The front axle is attached to the front support casting by means of a center pivot pin in a similar manner to the two wheel drive axle.

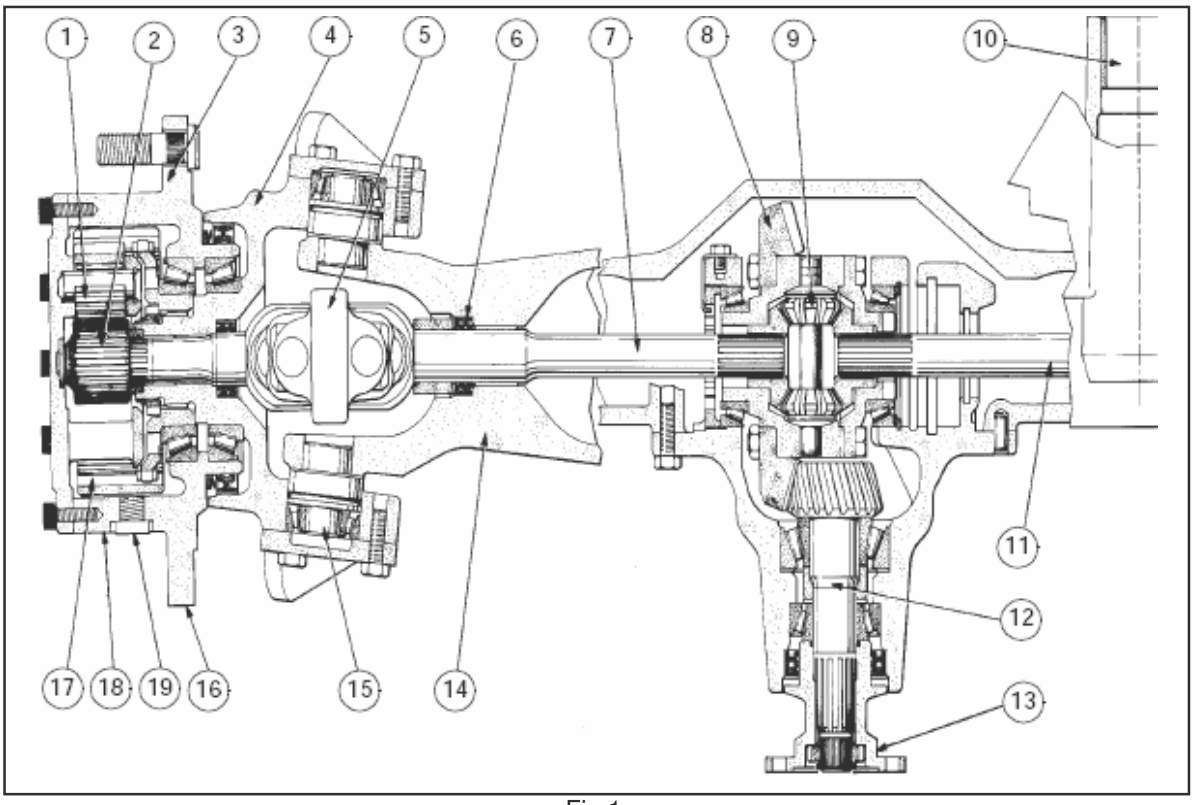

Fig 1

1. Planetary gears.
2. Sun gear.
3. Wheel studs.
4. Pivot housing.
5. Universal joint.
6. Oil seal.
7. Drive shaft.
8. Crownwheel.
9. Differential unit.
10. Axle pivot housing.
11. Drive shaft.
12. Pinion.
13. Drive coupling.
14. Axle housing.
15. Pivot pin.
16. Wheel hub.
17. Ring gear.
18. Planetary carrier.
19. Oil filler/drain plug.

7C.1 WHEEL ALIGNMENT AND STEERING STOPS

Adjust

Procedure Wheel alignment

1. Drive the tractor onto firm level ground and put the front wheels in the straight ahead position.
2. Check the wheel toe-in measured on the centre line of the axle at the wheel rim. Distance 'A' must be 0 - 0.196 inch (0- 5mm) greater than distance 'B'.
3. If adjustment is necessary, slacken the locknut on the track rods on one side.
4. Rotate the inner steering ball joint to either increase or decrease the track rod length to obtain the correct setting.
5. Tighten the track rod locknut to a torque of 83 lbf.ft (112Nm). Ensure that both track rods are the same length. Steering stops
6. The steering stop adjustment is made according to the maximum steering angle required.
7. Adjust the length of the bolt according to the table below and tighten the locknut.

   Steering angle Dimension 'X'

   35° . . . . . 3.051 inch (77.5 mm)

   40° . . . . . 2.6378 inch (67.0 mm)

   50° . . . . . 1.7126 inch (43.5 mm)

CAUTION: The normal setting is 50 °. Ensure that the tire does not foul the tractor when on full lock and full axle tilt.

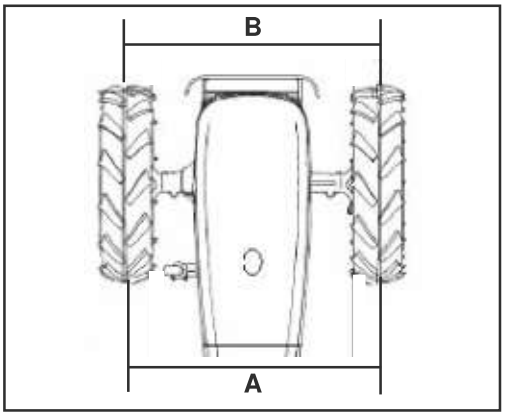

Fig 2

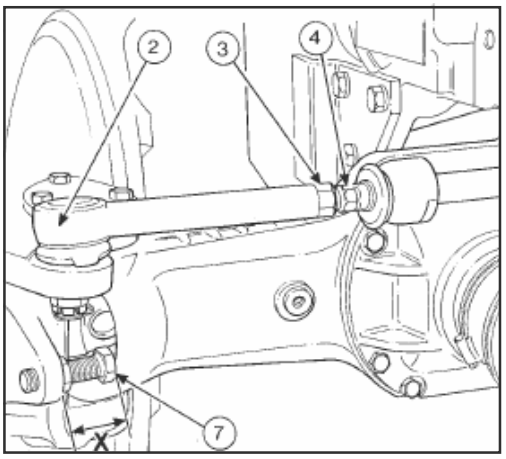

Fig 3

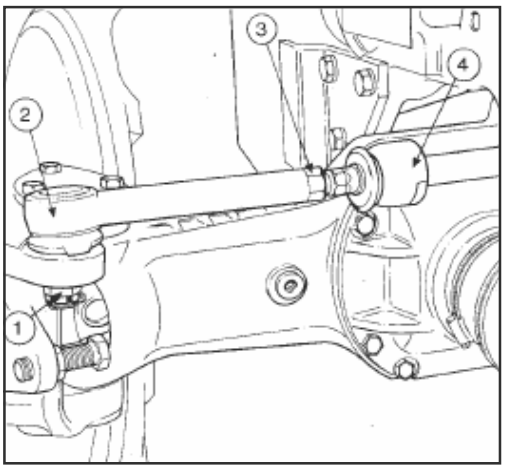

Fig 4

7C.2 TRACK ROD AND BALL JOINT

Removal and refitment

Removal

1. Remove the split pin and nut from the ball joint.
2. Remove the ball joint from the housing by using an extractor or by striking the housing with a hammer adjacent to the ball joint to release the taper.
3. Slacken the locknut and unscrew the ball joint from the track rod.
4. To remove the inner joint, hold the end of the steering ram piston rod with a spanner and unscrew the joint.

Refitment

5. Reverse procedure 1 to 4 except:

   a. Ensure that both track rods are the same length.

   b. Apply Massey Ferguson Stud Lock (Loctite 270) to the threads of inner joint and screw it into the end of the steering ram piston rod.

   c. Set the wheel alignment as described in operation 7C.1.

   d. Tighten the track rod lock nut to a torque of 83 lbf.ft (112Nm).

   e. Apply lubricating oil to the thread and tighten the ball joint nut to a torque of 78 lbf.ft (106Nm). Then tighten further as required to align the nut for the split pin. Renew the split pin.

7C.3 FRONT AXLE

Removal and refitment

Removal

1. Place a trolley jack under the engine sump and take the weight of the front of the tractor. DO NOT lift the front wheels off the ground.
2. Remove the front weights, if fitted.
3. Remove the front weight frame.
4. Disconnect the steering ram hoses at the cylinder end.Cap the ends of the pipes and hoses to prevent the ingress of dirt.
5. Disconnect the front axle drive shaft, see operation 7C.8.
6. Remove the bolt securing the axle pivot pin to the front support casting.
7. Remove the axle pivot pin. If difficulty is experienced in removal, there is a 18mm tapped hole in the end of the pin for extraction purposes.
8. Jack up the front of the tractor so that the axle can be wheeled out from under the tractor.
9. Recover the two thrust washers located each side of the axle pivot.
10. Place the axle on two axle stands and remove the wheels.

Refitment

11. The axle pivot pin is fitted with a thrust washer at the front and back between the axle and the support casting. To fit the thrust washers when replacing the axle, obtain a piece of tubing or bar 47.6mm (1.875 inch) diameter and 25mm long. This is to hold the rear thrust washer in place during assembly.

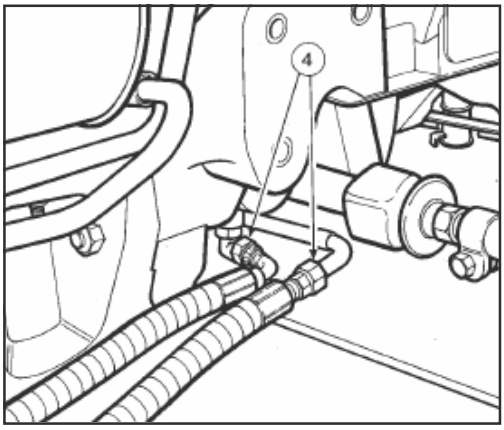

Fig 5

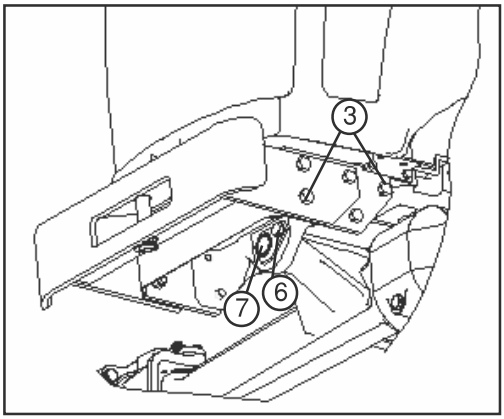

Fig 6

12. Place the tube or bar in the rear hole of the support casting so that it projects on the forward face. Coat one of the thrust washers with grease and place it on the tube or bar. Ensure that it is against the support casting face.
13. Lift the axle into position, pass the pivot pin through the front part of the support casting. Position the front thrust washer between the axle and casting. Continue to push the pin into the axle, through the rear thrust washer and into the casting at the rear. The pivot pin will push the piece of bar or tube out through the rear of the support casting.
14. Reverse procedures 1 to 10 except:

    a. On re-assembly grease the axle pivot pin.

    b. Check the steering to ensure that the hydraulic hoses have been correctly connected up turning the tractor to the left and right.

    c. Check that the steering hoses are correctly routed to prevent chaffing on sharp edges.

    d. Check the power steering pump oil level and remove the air from the system.

7C.4 PLANETARY CARRIER

Removal and refitment

Removal

1. Apply the parking brake and secure the rear wheels.
2. Raise the tractor under the side of the axle to be worked on, then support the axle on an axle stand.
3. Remove the wheel.
4. Rotate the hub until the plug is at the bottom. Remove the plug (8mm hexagon key will be required) and drain the oil from the hub.
5. Mark the position of the planetary carrier in relation to hub to assist alignment during refitment.

Later production hub

6. Remove the 12 bolts in the cover plate.
7. Remove the planetary cover plate.

Refitment

8. Reverse procedures 1 to 7 except:

   a.Apply Massey Ferguson Instant Gasket (Loctite 515) to the hub face.

   b. Apply a light coating of lubricating oil to the planetary carrier countersunk screws (on early models) and tighten to a torque of 35 lbf.ft (47Nm).

   c.Apply a light coating of lubricating oil to the 12 planetary carrier bolts (on later models) and tighten to a torque of 106 lbf.ft (78Nm).

   d.Rotate the wheel so that the plug is at three O'clock. Fill the hub to this level with an approved oil and refit the plug.

   e. Tighten the wheel nuts to a torque of 199 lbf.ft (270Nm).

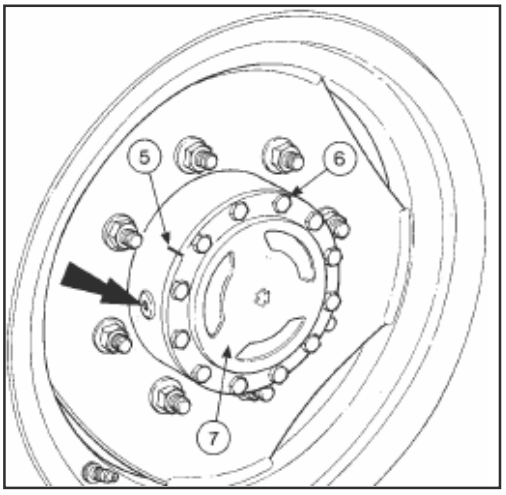

Fig 7

7C.5 HUB OIL SEAL

Removal and refitment

Special Tools:

MF.481	Hub nut wrench
MF.488	Hub Puller
MF.493	Hub seal installer
MF.495	Planetary ring gear replacer
MF.496	Wear ring installer

Removal

1. Remove the planetary carrier, see operation 7C.4.
2. Remove the circlip and sun gear.
3. With a narrow cold chisel and hammer carefully unstake the hub retaining nut where the lip has been driven down into the slot.
4. Using special tool MF.481 hub nut wrench, unscrew the retaining nut.
5. On later production tractors remove the planetary ring gear and hub with special tool MF.488 Hub Puller.
6. Place the cap over the end of the drive shaft. Bolt MF.488 across the face of the hub so that the forcing screw locates in the dimple in the cap. Adjust the length of the bolts so that they are all of equal length.

   IMPORTANT: *Lubricate all the threads of the forcing screw.*
7. Tighten the screw so that the hub and ring gear are drawn off the shaft.
8. Remove the wheel hub and ring gear from the tool.
9. Remove the dirt seal from the back of the hub.
10. With a cold chisel split the large oil seal and remove from the housing. Be careful not to damage the taper roller bearing.

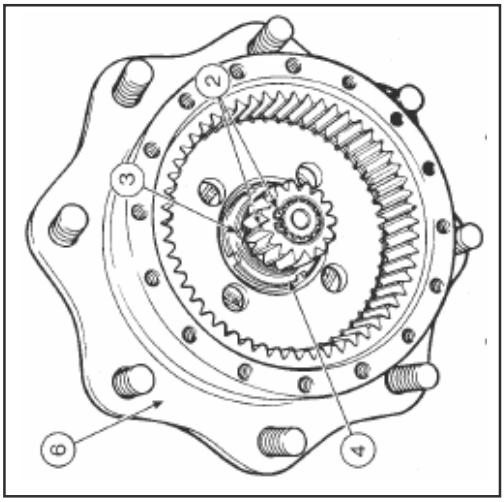

Fig 8

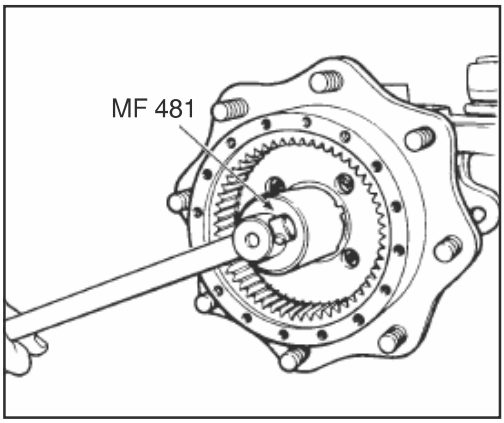

Fig 9

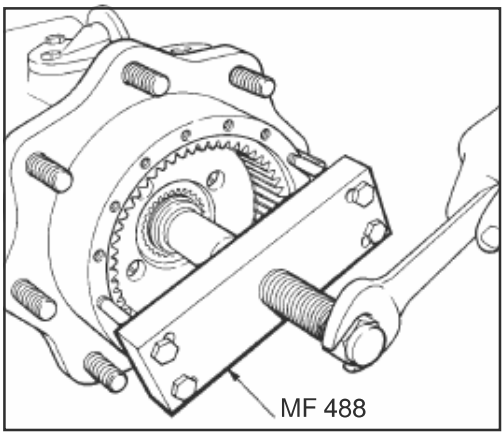

Fig 10

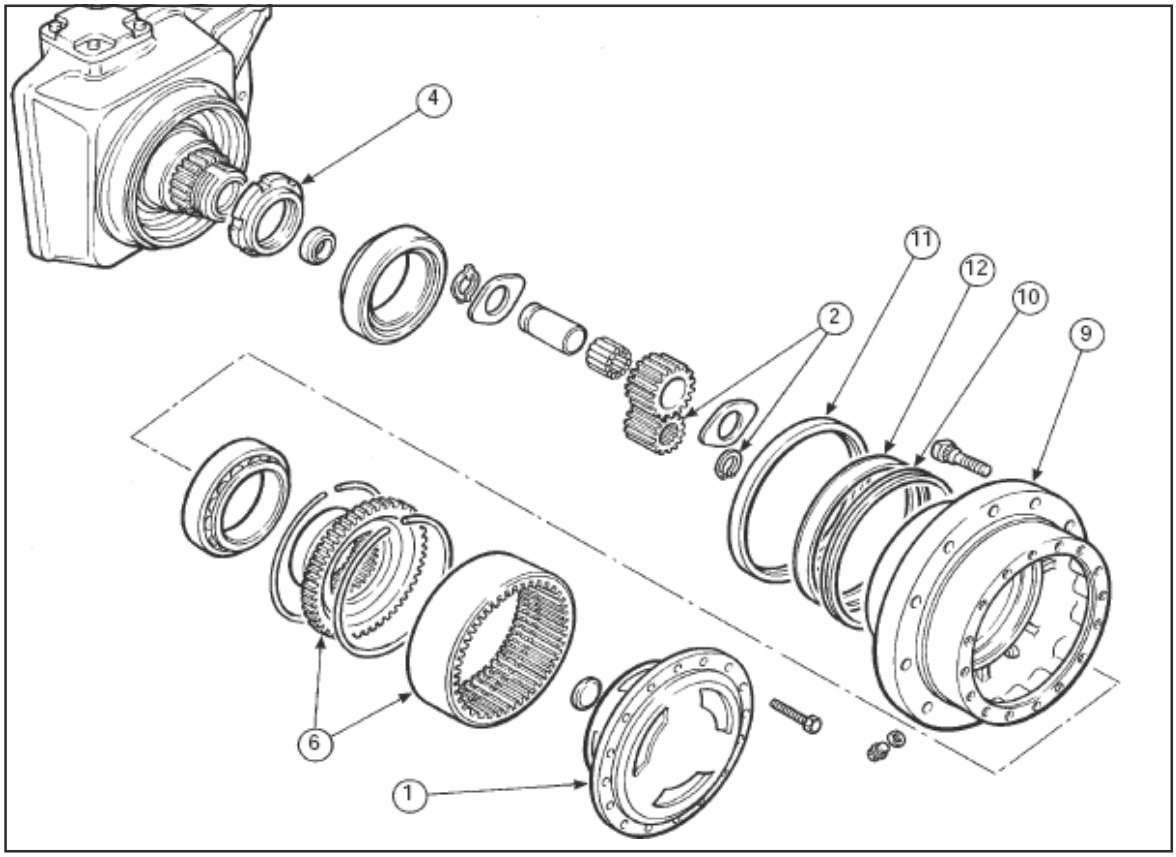

Fig 11

11. If necessary, remove the oil seal wear ring. With a cold chisel split the ring on the hub and remove.
12. Clean all components for re-assembly.

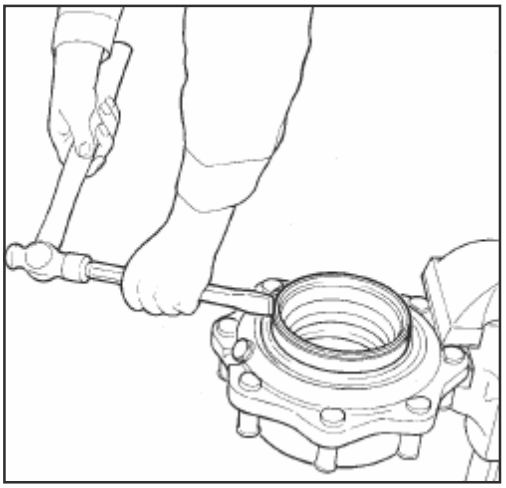

Fig 12

Refitment

13. Using special tool MF.493 Hub Seal Installer fit a new oil seal. Place the seal on the tool with the lip facing outwards.

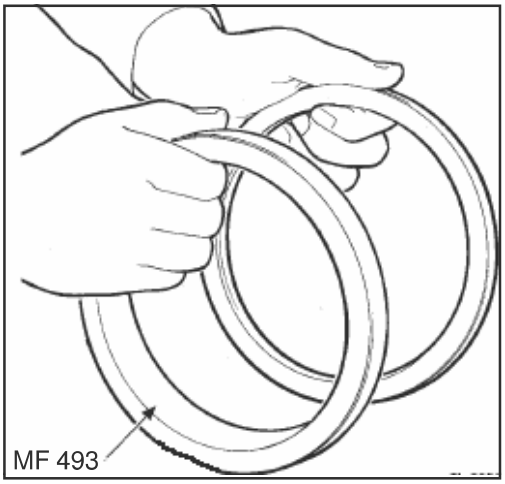

Fig 13

14. Offer the seal and tool assembly up to the swivel housing, with a hammer, gently drive the seal into the housing. Work around the seal driving in a small part at a time until it is fully home.

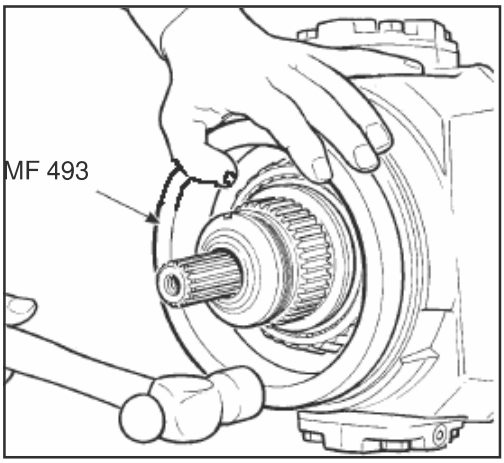

Fig 14

15. Fit the a new oil seal wear ring using special tool MF.496 Wear Ring Installer and a light hammer. Drive the wear ring down onto the hub using the same method when fitting the oil seal.

    NOTE: *The radius edge of the wear ring must face outwards.*

16. Renew the dirt lip seal on the back of the hub.
17. Fill the space between the dirt seal and the lip seal with general purpose grease. It must be 30 to 50% full. Also apply generous application grease to the lips of the seal.
18. Replace the hub.

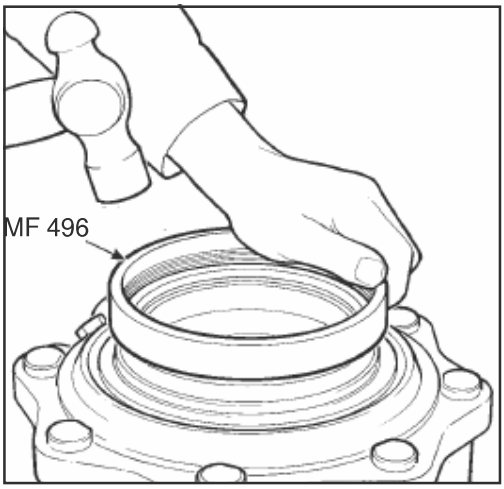

Fig 15

19. Replace the planetary ring gear carrier using special tool MF.495 Planetary Ring Gear Replacer.
20. To special tool MF.488 add the two extensions (part of MF.495) ensuring that the bolts are tight as shown in the illustration. It is important that they are fitted with the overlapping part to the outside.
21. Remove the top and bottom swivel pin caps and fit the two blocks complete with the threaded studs.
22. Suspend MF.488 on the studs and fit the nuts and washers.
23. Position the ring gear carrier so that the splines are in alignment. Place the cap over the end of the shaft and locate the forcing screw in the end of the cap.

    IMPORTANT: *Lubricate all the threads of the forcing screw.*
24. Tighten the screw until the carrier is pressed full home. DO NOT put excessive loads on the tool. Check by turning the hub to determine when the fitting has been completed.
25. Remove the special tool and replace the caps ensuring that the one with the shims is fitted on the top.
26. Renew the ring gear retaining nut and tighten to a torque of 313 lbf.ft (425 Nm) using special tool MF.481.
27. Hammer the lip of the nut down into the slot.
28. Replace the sun gear and circlip.
29. Replace the planetary carrier

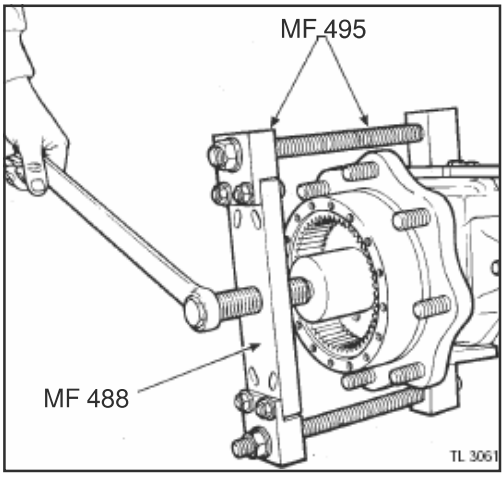

Fig 16

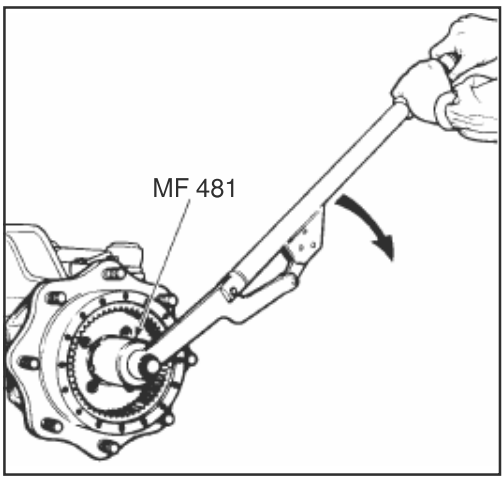

Fig 17

7C.6 PLANETARY CARRIER AND HUB

Overhaul

Dis-assembly

1. Remove the planetary carrier, see operation 7C.4.
2. Place the planetary carrier in a vice.
3. Remove the circlips.
4. Screw an 8mm bolt into the end of the shaft and withdraw the planetary gear shaft holding the gear in place.
5. Carefully remove the planetary gear and thrust washers taking care not to dislodge the needle roller bearings.
6. Remove the needle rollers and thrust washers by emptying them into a clean container.
7. Repeat procedures 3 to 6 for the remaining two planetary gears.
8. Remove the circlip and sun gear.
9. Dismantle the hub, see operation 7C.5.
10. If necessary, remove the two circlips and dismantle the ring gear.
11. If necessary, remove the two bearing cups.
12. Remove bearing cones. If this is necessary, the cage will have to be broken, and the rollers removed. To remove the inner track, heat it with a gas torch until it expands and can be removed with a pry bar.

    Examination: Thoroughly clean and inspect all components and renew any that are worn or damaged. Renew all 'O' rings and seals.

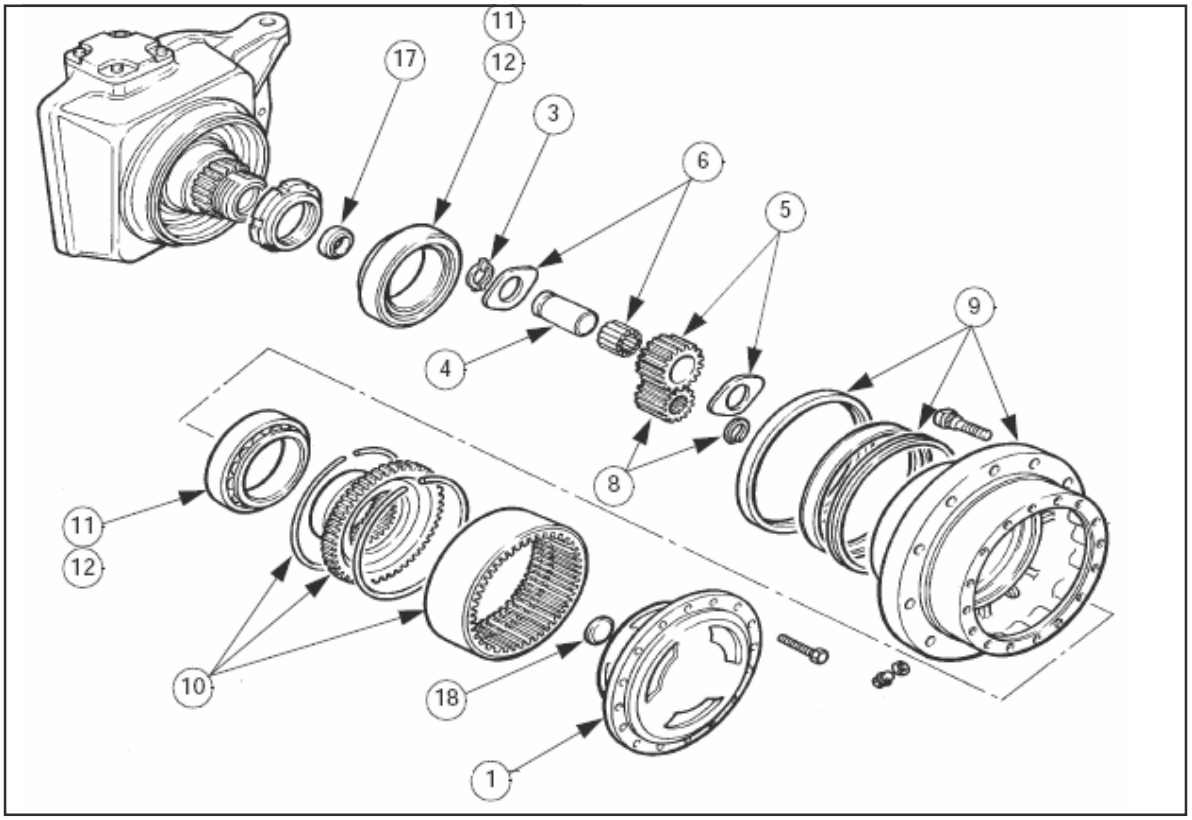

Fig 18

Re-assembly

13. Fit the inner taper roller bearing cone.
14. Fit the two taper roller bearing cups to the hub.
15. Fit the taper roller bearing cone to the planetary ring gear.
16. Re-assemble the ring gear fitting the two circlips and gear.
17. If the thrust ring has been removed it is retained in the housing with Massey Ferguson Stud Lock (Loctite 270).
18. If the drive shaft thrust pad has been removed it is retained in the cover with Massey Ferguson Stud Lock (Loctite 270).
19. Re-assemble the hub and seals, see operation 7C.5.
20. Refit the sun gear and circlip.
21. Refit the planetary carrier.
22. Re-assemble the planet gears. Use petroleum jelly, NOT grease, to hold the needle rollers and thrust washers in place during assembly. Each planetary gear contains 17 needle rollers.
23. Refit the gears to the planetary carrier using new circlips to hold the shafts in place.

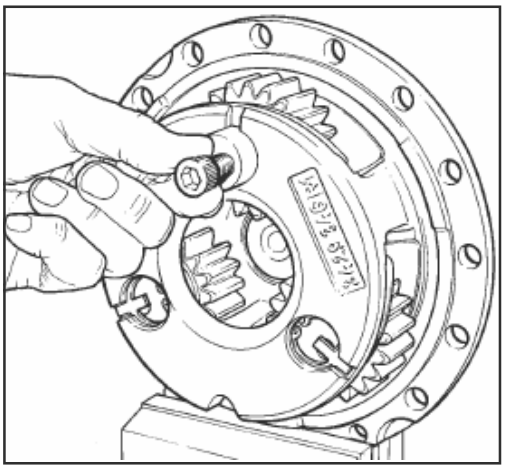

Fig 19

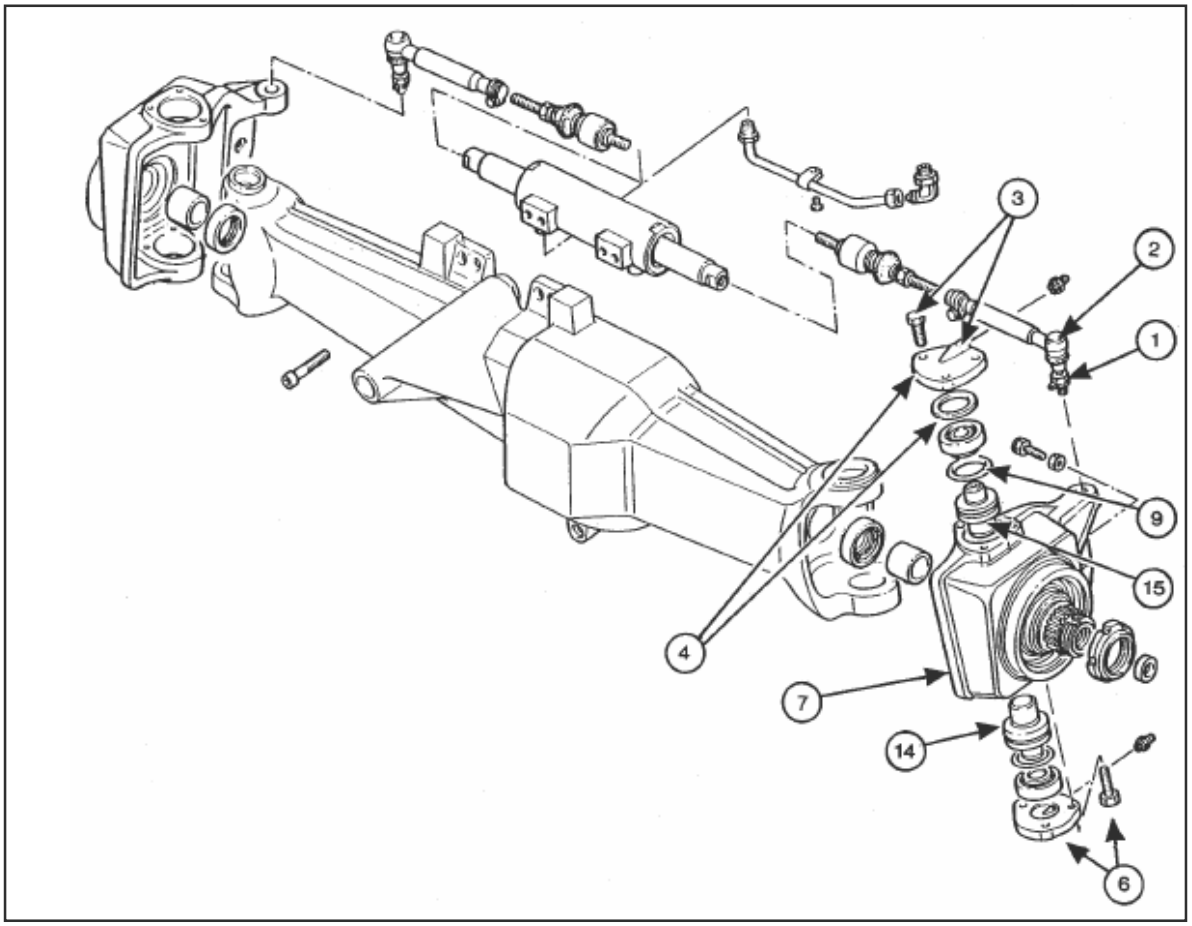

Fig 20

7C.7 SWIVEL HOUSING AND PINS

Removal and refitment

Special Tools:

MF.195C	Bearing puller - main tool
MF.451B	Steering pin bearing remover

Removal

1. Remove the split pin and steering ball joint nut.
2. Release the steering ball joint from the housing.
3. Remove the four bolts and the upper cap.
4. Remove the shims and bearing cup.
5. Using special tool MF.451B and MF.195C to extract the upper pivot pin. Screw the 14mm adaptor into the pin and onto the main puller. Remove the pin from the housing.

   IMPORTANT: *Lubricate all the threads of the forcing screw.*

6. Remove the four bolts and cap from the lower bearing and repeat the extraction of the pivot pin.
7. The housing can now be removed from the axle complete with the drive shaft.
8. This operation can now be repeated on the other side if the crownwheel and pinion assembly is to be removed.

   Examination: Thoroughly clean and inspect all components and renew any that are worn or damaged. Renew all 'O' rings and seals.

Refitment

9. Renew the seals on the pivot pins.
10. Fit the bearing cones to the pivot pins. DO NOT grease the bearings at this stage.
11. Coat the pivot pins and holes with a light application of grease.

12. Hold the housing in position and partly fit the upper pivot pin to locate the assembly.
13. Refit the lower pivot pin, bearing cup, cap and bolts. NO shims are fitted to the lower cap.
14. Tighten two opposing bolts evenly and in sequence to pull the lower pivot pin into the housing. Tighten the four bolts to a torque of 52 lbf.ft (70Nm).
15. Fit the upper bearing cup, shims, cap and bolts. Add additional shims to ensure that the pivot pins are seated on the axle casing. Tighten two opposing bolts evenly and in sequence to press the pivot pin into the housing.
16. Check that both pivot pins are fully seated onto the axle casing.
17. Remove the upper cap and shims.
18. Replace the cap and tighten the four bolts to torque of 52 lbf.ft (70Nm).
19. Using a dial indicator gauge and lever as shown in the illustration, determine the end-float of the two pivot bearings.

    When lifting the housing up and down with the lever ensure that you get the maximum reading on the dial indicator gauge. The correct bearing pre-load is 0.006 - 0.0098 inch (0.15 - 0.25 mm).
20. Select the required shims by the following method: Shims required = End-float + Pre-load Select shims from the following chart:

Part number	Thickness	
	mm	inch
3427 190 M1	0.1	0.004
3427 191 M1	0.15	0.006
3427 192 M1	0.3	0.012
3427 193 M1	0.5	0.020
3427 194 M1	0.7	0.028
3427 195 M1	1.0	0.040

21. Remove the upper cap and bearing cup. Fill the bearing with grease, fit the correct number of shims, replace the cap.
22. Apply lubricating oil to the threads of the bolts and tighten to a torque of 52 lbf.ft (70Nm).
23. Remove the lower bearing cap and cup and fill the bearing with grease. Tighten the bolts as described in procedure 22.
24. Grease both bearings with a grease gun to ensure that they are full.
25. Apply lubricating oil to the thread and tighten the ball joint nut to a torque of 78 lbf.ft (106 Nm). Then tighten further as required to align the nut for the split pin. Renew the split pin.

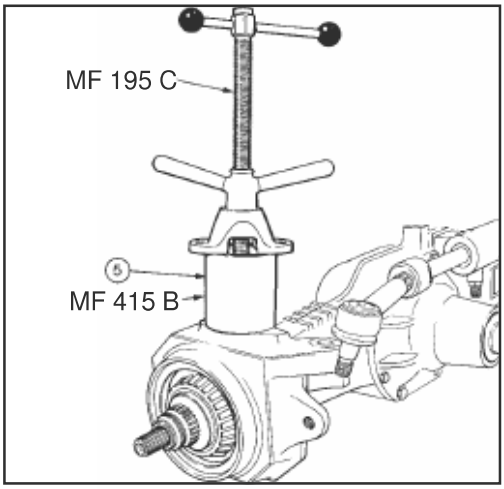

Fig 21

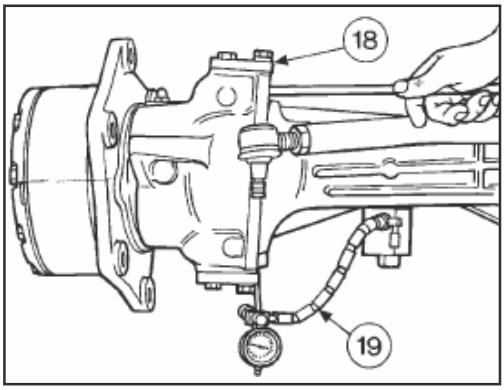

Fig 22

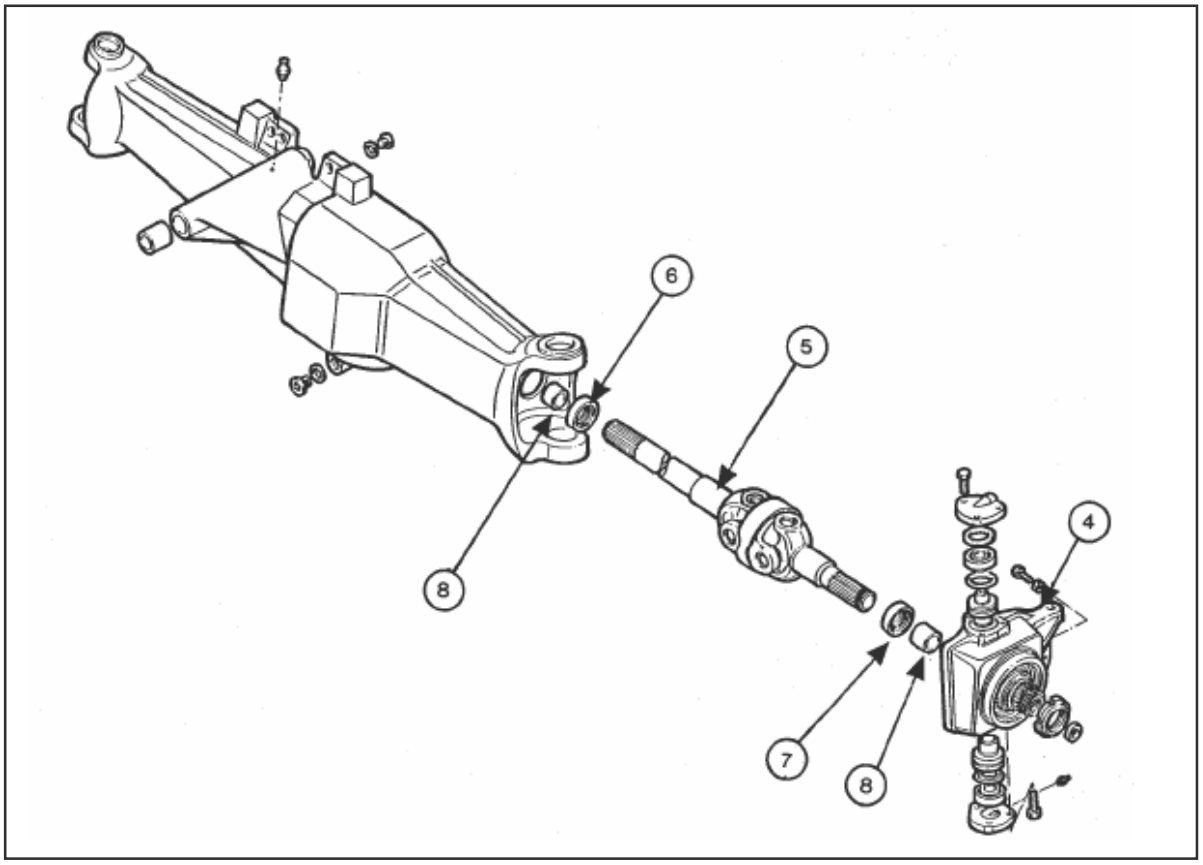

Fig 23

7C.8 DRIVE SHAFT AND OIL SEALS

Removal and refitment

Removal

1. Drain some of the oil from the axle casing.
2. Remove the planetary carrier, see operation 7C.4.
3. Remove the circlip and sun gear.
4. Remove the swivel housing, see operation 7C.7.
5. Remove the drive shaft from axle casing.
6. Lever the seal out of the axle casing, if necessary.
7. Lever the seal out of the pivot housing, if necessary.
8. Remove the drive shaft bushings, if necessary.

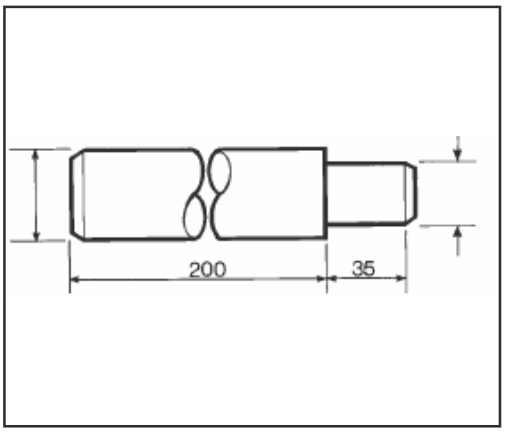

Fig 24

Examination : Carefully inspect the universal joints in the drive shaft, if there is any sign of wear renew the joints or fit new shafts.

Refitment

9. Fit new seals in the axle casing and swivel housing. It is recommended that a special tool is made to carry out this operation. The illustration gives the dimensions for the tool. This tool can be used to fit new drive shaft bushes in the axle casing and swivel housing if required.
10. Place the bushing on the special tool and drive it into the housing. The bushes must be fitted with the split line at three 'o'clock, see illustration, and installed to a depth of 0.0787 inch (2 mm) behind the oil seal facing.
11. Fit a new dust seal to the crownwheel and pinion side of the drive shaft.
12. Reverse procedure 1 to 5 except:

    a. Refill both the axle and planetary carrier to the correct level with an approved oil.

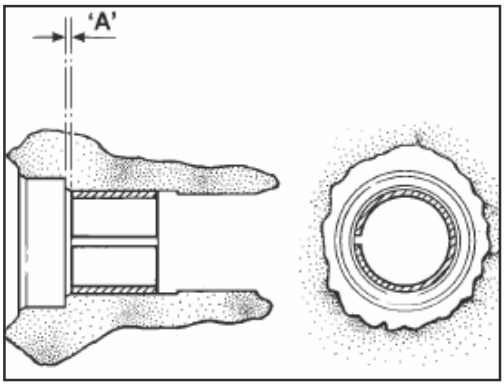

Fig 25

7C.9 DRIVE SHAFT

Overhaul

Dis-assembly

1. Remove the drive shaft, see operation 7C.8.
2. Hold the inner section of the drive shaft in a soft faced vice.
3. Remove the four circlips from each end of the universal joint.
4. Using a hammer, drive the central yoke downwards until the bearing sleeve protrudes.
5. Clamp the bearing sleeve in a vice and tap the central yoke from the bearing.
6. Remove the opposing bearing sleeve in the same way and remove the outer section of the shaft.
7. Turn the shaft assembly through 90 °, then repeat procedures 4 to 6 to free the other universal joint from the shaft.
8. Grip the outer section of the drive shaft in a vice and repeat procedures 2 to 7.

   Examination : Pay particular attention to the axle shaft splines. Inspect all components and renew any which show signs of wear or damage. Always renew the universal joint as an assembly including the joint, bearings, caps, circlips and seals.

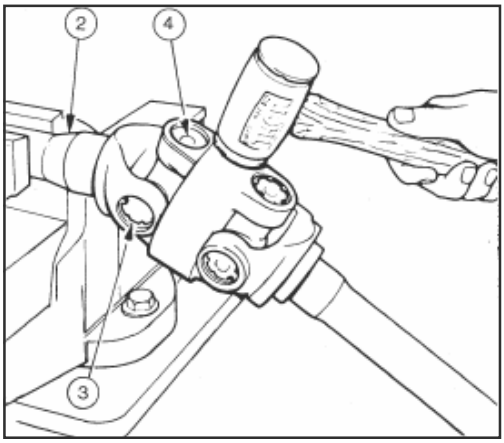

Fig 26

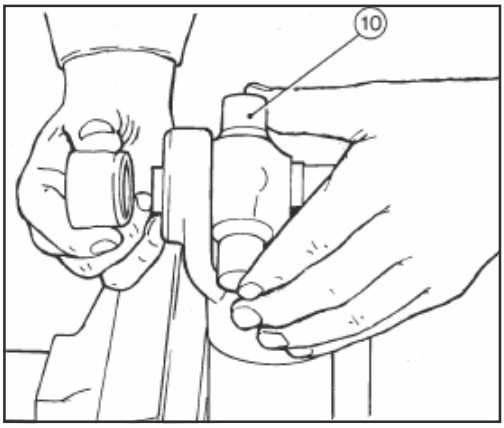

Fig 27

Re-assembly

9. Ensure that the needle rollers are held in place with a little grease in the bearing sleeve.
10. Position the cross within the yoke and move it sideways as far as possible to provide a guide for the needle rollers in the bearing sleeve when being refitted.
11. Slide the bearing sleeve onto the cross and drive the bearing into the yoke deep enough to permit the insertion of the circlip.
12. Assemble the remaining sleeves and universal joint in a similar method.
13. Thoroughly lubricate the universal joint with a grease gun after completing assembly and before fitting to the axle.
14. Refit the drive shaft to the axle.

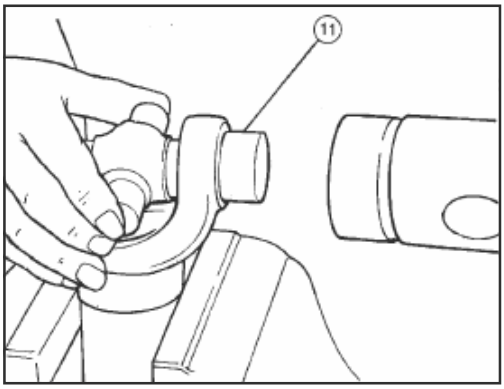

Fig 28

7C.10 PINION OIL SEAL

Removal and Refitment

Special Tools:

MF.480 Pinion nut wrench

Removal

1. Apply the tractor parking brake.
2. Place a container under the axle and drain some of the oil from the casing.
3. Slacken the two hose clips and slide back the drive shaft guard.
4. Slacken the front guard hose clip and slide the guard forward.
5. Remove the four bolts and disconnect the universal joint.
6. With a small hammer and cold chisel carefully chisel away the lip of the pinion nut which has been driven down into the slot.
7. Using special tool MF.480 pinion nut wrench, remove the pinion nut.
8. Remove the drive coupling.
9. Remove the 'O' ring and discard.
10. Lever the oil seal out of the casing

Refitment

11. Make the special seal tool as shown in the illustration on page 7C -19.
12. Renew the oil seal.

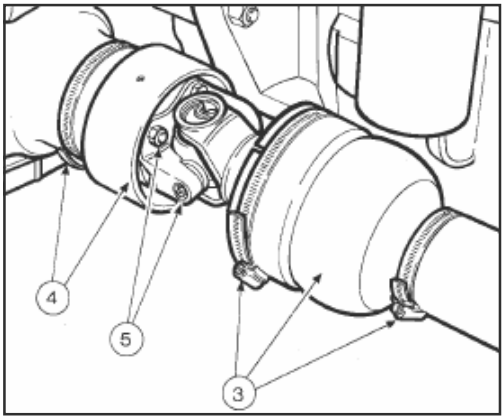

Fig 29

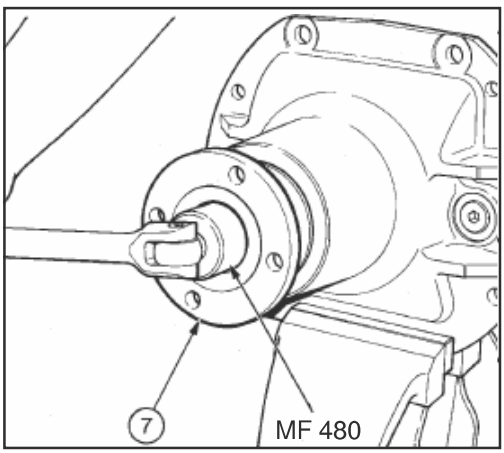

Fig 30

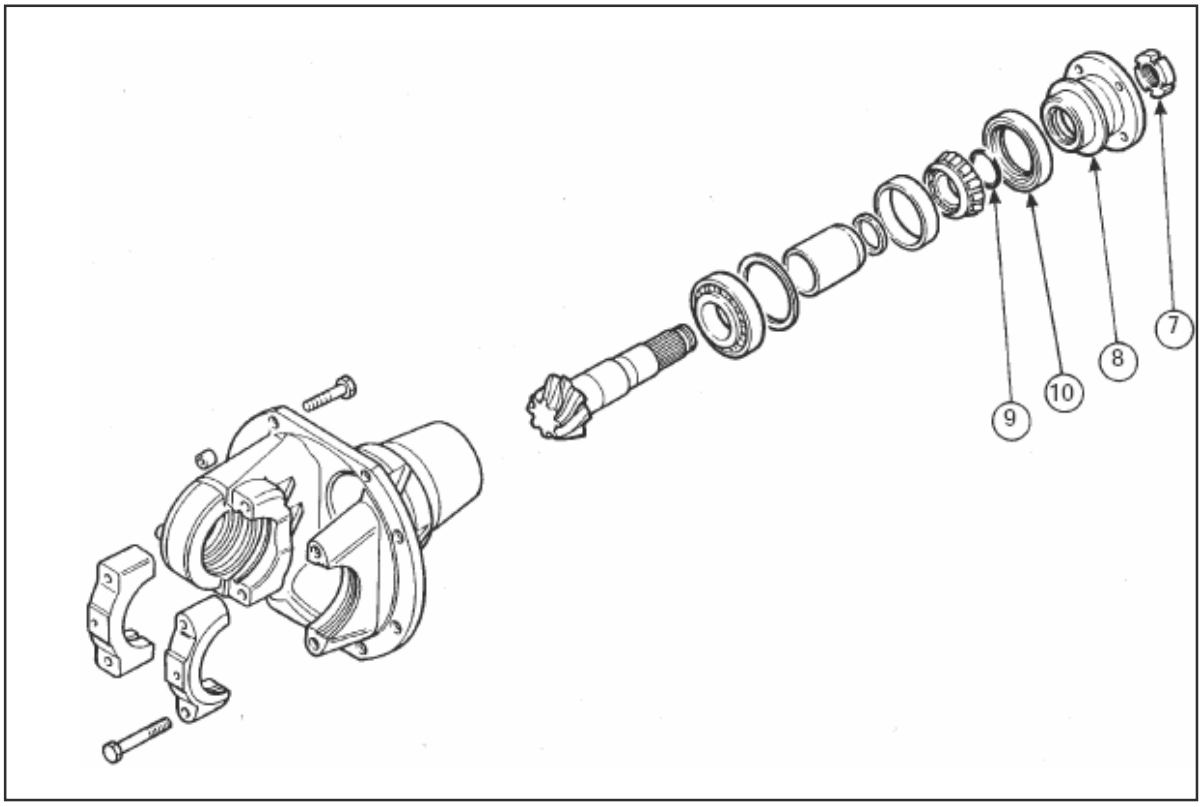

Fig 31

13. Renew the shaft 'O' ring.
14. Apply general purpose grease to the cavity of the oil seal
15. Replace the drive coupling.
16. Renew the pinion nut and tighten dry to a torque of 218 lbf.ft (295 Nm) using special tool MF.480.
17. With the aid of a hammer and punch drive the lip of the nut into the slot on the shaft to lock it.
18. Reconnect the drive shaft and guard, see operation 7C.3.
19. Refill the axle case with an approved oil to the correct level.

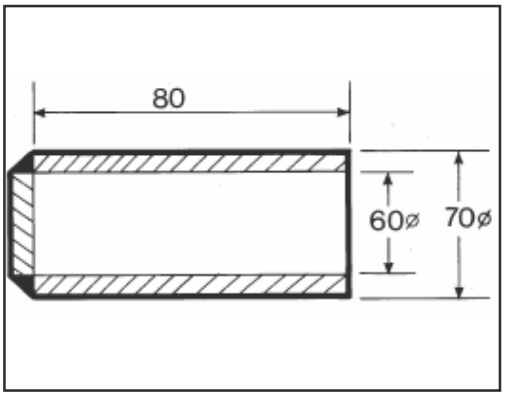

Fig 32

7C.11 DIFFERENTIAL ASSEMBLY

Removal and refitment

Removal

1. Secure the tractor by applying the parking brake.
2. Jack up the front of the tractor and support under the engine.
3. Slide back the drive shaft guard and disconnect the drive shaft, see operation 7C.8.
4. Remove the axle from the tractor, see operation 7C.3.
5. Remove both front wheels.
6. Drain the oil from the axle casing.
7. Remove both swivel housings, see operation 7C.7. It is not necessary to dismantle the planetary hubs.
8. Remove the steering ram, see operation 7C.14.
9. Remove the eight bolts holding the differential case to the axle casing.

WARNING: Take care when removing the differential assembly, it is awkward and heavy to handle.

10. The differential is located by dowels in the axle casing. Carefully pry it away from the casing supporting the weight at all times.

Refitment

11. Reverse procedure 1 to 10 except:

    a. Apply Massey Ferguson Instant Gasket (Loctite 515) to the joint face of the differential case.

    b. Apply lubricating oil to the differential case bolts and tighten them to a torque of 52 lbf.ft (70Nm).

7C.12 DIFFERENTIAL ASSEMBLY

Overhaul

Special Tools:

MF.471 Hydraulic spring compressor

Dis-assembly

These instructions cover two types of differential, the standard type and Hydralock. The Hydralock type is a hydraulic method of locking the differential.

The Hydralock assembly may be fitted to the axle but not used, a plug will be fitted in place of the hydraulic connection.

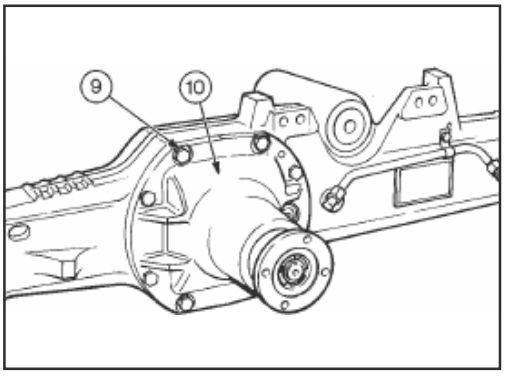

Fig 33

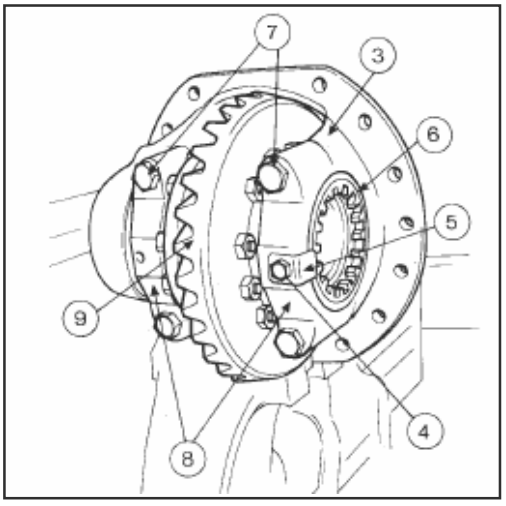

Fig 34

1. Remove the differential assembly, see operation 7C.11.
2. Hold the differential assembly in the jaws of a vice.
3. Mark the end caps and casting to aid re-assembly.
4. Remove the securing bolt.
5. Remove the locking tab.
6. Unscrew the bearing adjustment ring nut.
7. Remove the cap bolts.
8. Remove the end caps.
9. Lift the differential assembly out of the casing.
10. Remove the bearing cups.
11. Remove the shims and retain for re-assembly.
12. Remove the retaining ring.

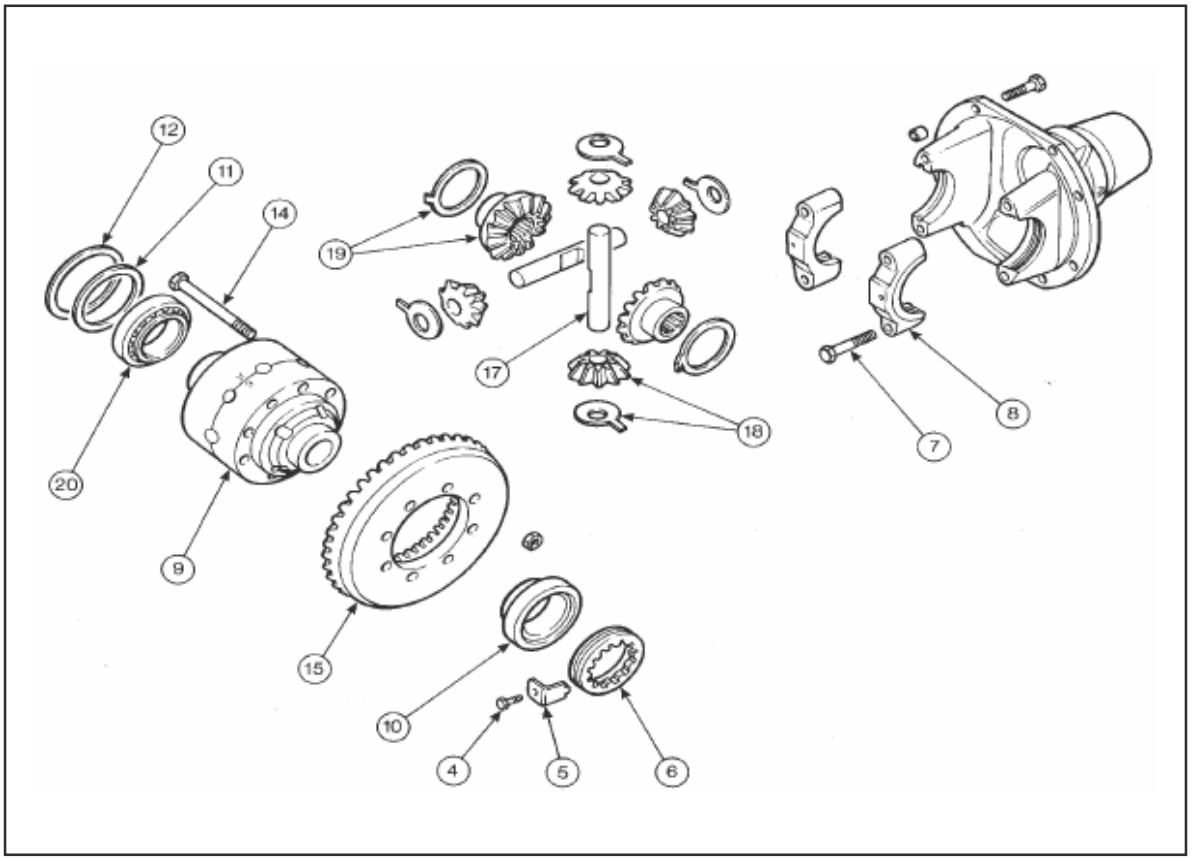

Fig 35

13. Mark the two halves of the differential case and the crown wheel to aid re-assembly.
14. Place the crownwheel and differential unit in the vice and remove the eight nuts and bolts.
15. Remove the crownwheel.
16. Split the differential case.
17. Remove the differential cross.
18. Remove the differential gears and side washers.
19. Remove the differential side gears and thrust washers.
20. Remove the taper roller bearing cones from the differential housing.

    Examination : Thoroughly clean and inspect all components. Any parts showing signs of wear or damage must be renewed. Renew all 'O' rings, seals and circlips.

Re-assembly

21. Refit the retaining ring.
22. Refit the removed shims.

Crownwheel and differential

23. Refit or renew the taper roller bearing cones if they have been removed.
24. Refit the differential gears, cross and thrust washers to the case.
25. Align the previously made marks on the case and the crown wheel if the original wheel is being re-used. Refit the eight bolts, apply Massey Ferguson Stud Lock (Loctite 270) to the threads and tighten to a torque of 112 lbf.ft (83 Nm).
26. Refit the bearing cups and refit the crownwheel and differential assembly. The crownwheel is mounted on the left side of the differential.
27. Refit the bearing caps and lightly tighten the bolts.

Bearing pre-load

28. Tighten the adjuster ring to take up the backlash between the taper roller bearings.

29. Finally, turn the adjuster ring a further three notches until the slot is aligned with the locking plate to apply the correct pre-load.

Crownwheel and pinion backlash

30. With a dial indicator gauge check the backlash between the crown wheel and the pinion. Fit the indicator gauge as shown in the illustration, the clearance should be from 0.0051 - 0.007 inch (0.13 to 0.18mm).

31. If the reading is too high or too low it will be necessary to move the crown wheel and differential to the left or right depending upon the clearance. Maintain the pre-load by unscrewing and screwing-up both rings by the same amount to obtain the clearance required.

Part number	Thickness	
	mm	inch
3428 747 M1	0.10	0.004
3428 748 M1	0.15	0.006
3428 749 M1	0.30	0.012
3428 750 M1	0.50	0.020
3428 751 M1	0.70	0.028
3428 752 M1	1.00	0.040

Check the thickness of the pack with a micrometer.

32. When the setting is correct remove each cap bolt in turn and apply Massey Ferguson Stud Lock (Loctite 270) to the thread. Tighten the bolts to a torque of 105 lbf.ft (143Nm).

33. Replace the locking tab and bolt.

34. Check the rotation of the crown wheel and pinion to ensure satisfactory operation.

35. Refit the differential unit to the axle casing.

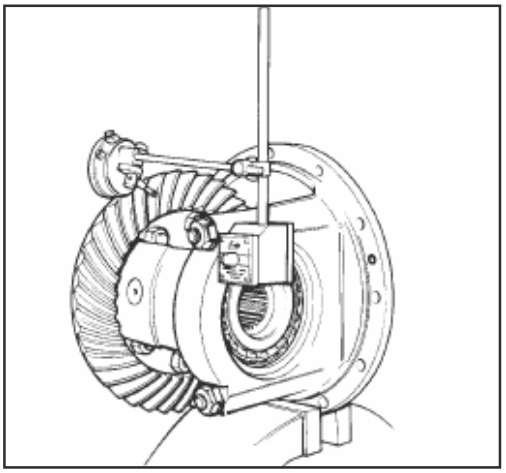

Fig 36

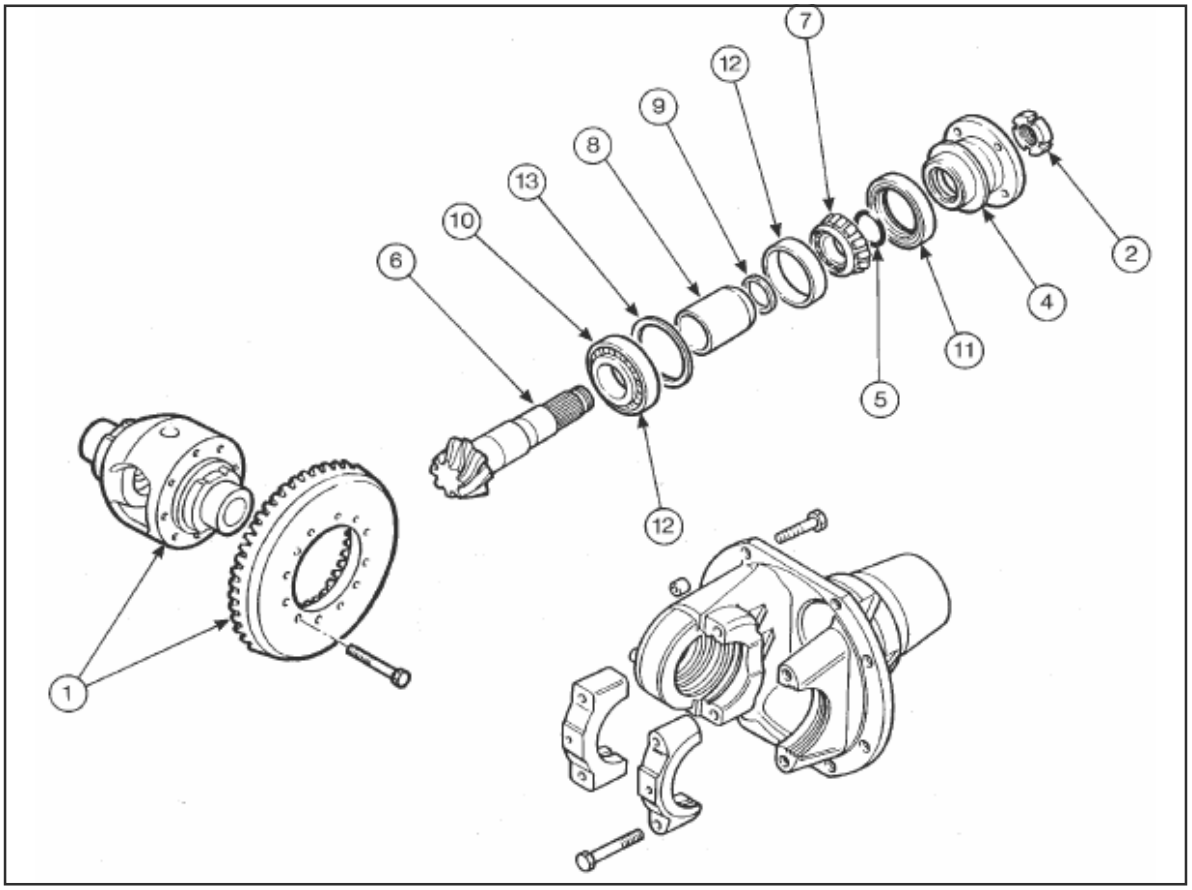

Fig 37

7C.13 CROWNWHEEL AND PINION

Overhaul

Special Tools:

MF.480	Pinion nut wrench
FT.4062A	Pinion pre-load gauge

Dis-assembly

1. Remove and dismantle the crownwheel and differential assembly, see operation 7C.12.
2. With a narrow cold chisel and hammer carefully unstake the pinion nut securing it to the pinion shaft.
3. Using special tool MF.480 pinion nut wrench, remove the pinion nut.
4. Remove the drive coupling.
5. Remove the 'O' ring and discard.
6. With the aid of a soft faced hammer or press remove the pinion with bearings from the case.
7. Remove the outer bearing cone.
8. Remove the spacer.
9. Remove the bearing pre-load shims and retain for re-assembly.
10. Remove the inner bearing cone with a bearing separator plate and press.
11. Remove the oil seal.
12. Remove the inner and outer bearing cups.
13. Remove the pinion depth of mesh shims.

Examination: Thoroughly clean and inspect all components. Any parts showing signs of wear or damage must be renewed.

Renew all 'O' rings, seals and circlips. Ensure that all parts are free from dents or damage.

Re-assembly

The crownwheel and pinion are only available as a matched set. If the crownwheel and pinion are not to be replaced the following instructions on setting the pinion may be disregarded. The two sets of shims must be retained for re-assembly.

It is necessary to carry out a series of measurements and calculations and procedures to establish the exact position of the pinion in relation to the crownwheel and the pinion bearing pre-load. It is recommended that you work in the metric system for ease of calculation.

Pinion settings - depth of mesh

14. The height of the pinion is adjusted by shims under the taper roller bearing to obtain dimension 'A'. The shims required are calculated in accordance with the following formula:

    Sp = A- (D ± R)

    Sp = Shim thickness.

    A = Actual dimension from centre line of crown wheel to the top of the taper roller bearing without shims.

    D = Nominal dimension of 3.58 inch (91mm).

    R = Actual tolerance of dimension 'D' etched on the bevel pinion. This value may be a positive (+) or a negative (-) to be added or subtracted from the nominal dimension 'D'.

    For the next series of operations you will require a precession depth gauge.

15. Fit the upper taper roller bearing cup and cone into the housing without shims.

16. Place the housing in the vertical position on the bench. Place a straight edge across the bearing cap faces and measure from the top of the straight edge to the top of the bearing. Subtract the width of the straight edge from your reading and record dimension 'A'.

17. Dimension 'D' is a fixed dimension of 3.582 inch (91mm) which must always be adhered to.

18. Inspect the end of the pinion and record tolerance 'R', plus or minus.

19. Using the figures you have obtained above and the formula calculate the shim thickness required.

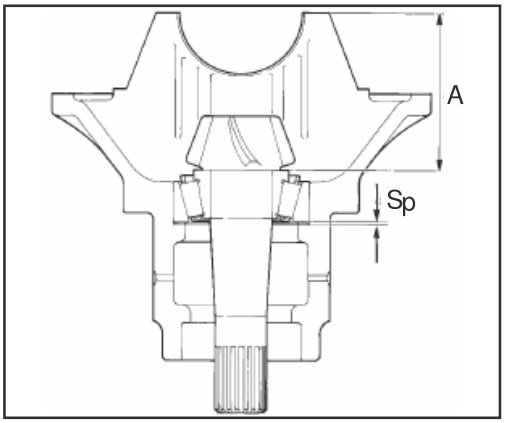

Fig 38

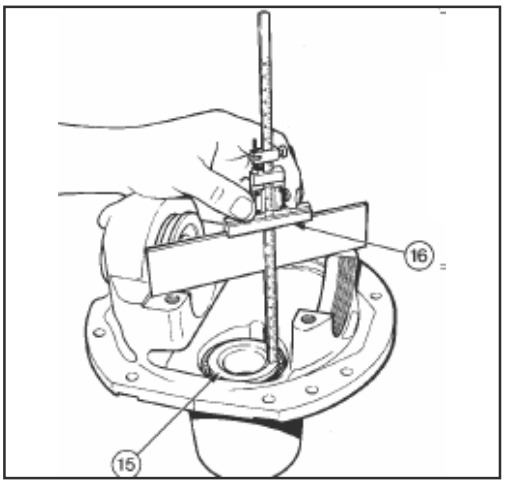

Fig 39

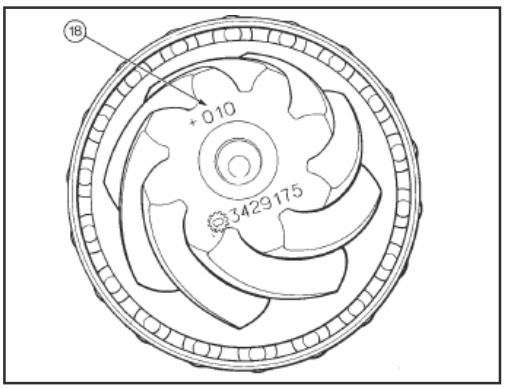

Fig 40

Example:

Where A = 3.620 inch (91.96mm) (measured).

D = 3.582 inch (91mm) (nominal).

R = +0.0003 inch (+0.010mm) (tolerance).

Sp = 3.620 inch (91.96mm) less (3.582 inch (91mm) +0.0003 inch (+0.010mm).

Sp = 0.0374 inch (0.95mm).

Shims required:- 1 x 0.15. 1 x 0.3 and 1 x 0.5.

Check the thickness of the pack with a micrometer. It may be necessary to round-off to the nearest value that can be made into a shim pack. Select the higher value if new bearings are being fitted. Shims are available in the following sizes:

Part number	Thickness	
	mm	inch
3428 722 M1	0.1	0.004
3428 723 M1	0.15	0.006
3428 724 M1	0.3	0.012
3428 725 M1	0.5	0.020
3428 726 M1	0.7	0.028
3428 727 M1	1.0	0.040

20. Remove the bearing, place the shim pack into the housing and fit the inner taper roller bearing cup.
21. Fit the outer taper roller bearing cup.
22. Press the inner taper roller bearing cone on to the pinion.
23. Replace the bearing spacer with the chamfered end facing the drive coupling.
24. Replace the shims that were removed on dis-assembly as a starting point, bearing cone, coupling and a new nut. DO NOT fit the oil seal.
25. Tighten the nut dry to a torque of 218 lbf.ft (295 Nm). Tap the pinion in both directions to ensure that the bearings are fully seated.
26. Lightly lubricate the bearings.

Pinion bearing pre-load

27. It is now necessary to set the taper roller bearing pre-load by selecting the correct shims to be placed between the spacer and outer bearing. The correct rotational torque is 18 lbf.inch (2 Nm). This can be determined by using special service tool FT 4062A or making a special gauge as shown in the illustration.
28. Special service tool FT 4062A is calibrated in pounds force inches (lbf in.) moving the 2 lb weight to the 18 inch. mark on the rod represents 18 lbf.inch (2Nm).
29. Alternatively, select a length of flat bar and cut off 450mm. Drill two 10mm diameter holes 80mm apart in the center of the bar. Cut a notch 200mm from the center in the top of the bar. Obtain a weight of 2.204 lbs (1 Kg), if this is not available, cut a 63mm length of 50mm diameter steel bar and attach a length of cord to the top.
30. Attach special tool FT.4062A, or bolt the tool you have made to the drive coupling with two bolts. With the bar horizontal hang the weight from the notch, this is equal to a rotational torque of 18 lbf.inch (2Nm).

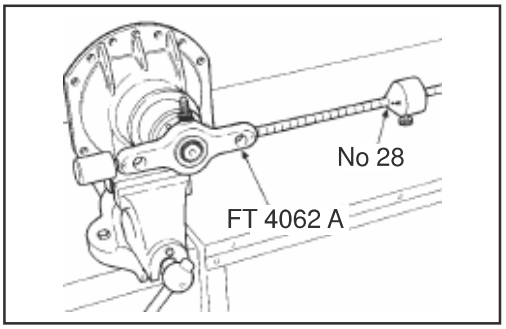

Fig 41

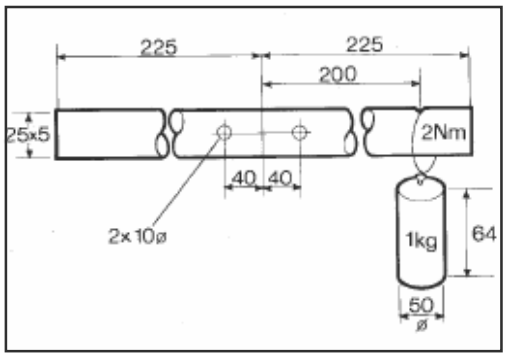

Fig 42

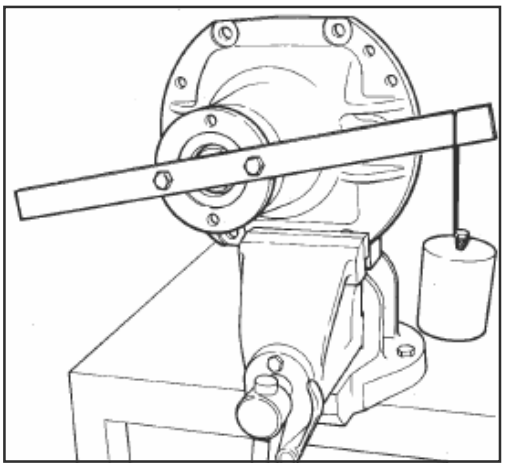

Fig 43

31. The setting is correct when you touch the weight end of the bar or tool and it slowly rotates from the horizontal to the vertical position. To obtain this condition it may be necessary to adjust the shim thickness several times. Shims are available in the following thicknesses:

Part number	Thickness	
	mm	inch
3428 253 M1	0.1	0.004
3428 254 M1	0.15	0.006
3428 255 M1	0.3	0.012
3428 256 M1	0.5	0.020
3428 257 M1	0.7	0.028
3428 258 M1	1.0	0.040

32. Renew the oil seal using the special tool described in section 7C.10.
33. Renew the shaft 'O' ring.
34. Apply general purpose grease to the cavity of the oil seal.
35. Replace the drive coupling.
36. Replace the pinion nut. Make up a suitable holding tool and tighten the nut to a torque of 218 lbf.ft (295Nm) using special tool MF.480.
37. With the aid of a hammer and punch drive the lip of the nut into two opposite slots on the shaft to lock it.
38. Replace the crown wheel and differential assembly setting the clearance as described in operation 7C.12.
39. Rebuild the axle and refit to the tractor.

7C.14 STEERING RAM

Removal and refitment

Removal.

1. Remove the front axle assembly, see operation 7C.3.
2. Remove the split pins and disconnect both steering ball joints.
3. Holding the ends of the steering ram piston rod with a spanner unscrew both track rods.
4. Remove the four hexagon cap screws (8mm hexagon wrench will be required) and the steering ram.

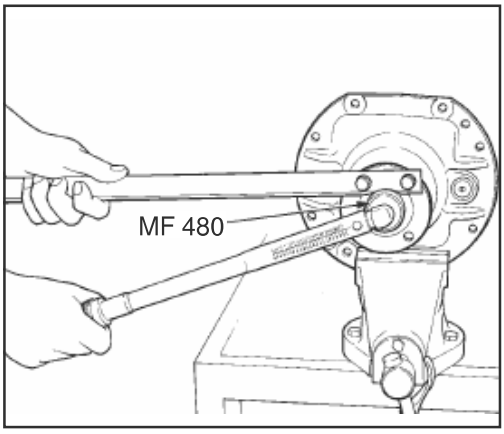

Fig 44

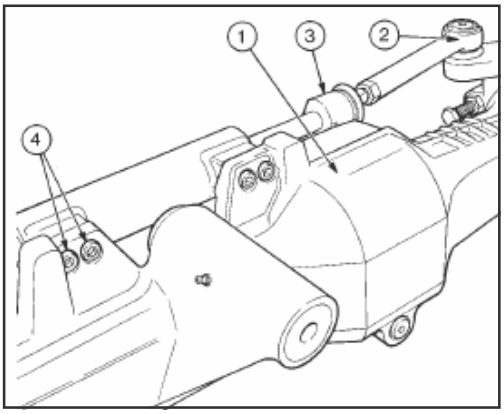

Fig 45

Refitment

5. Reverse procedure except:

   a. Tighten the four cap screws to a torque of 79 lbf.ft (107Nm).

   b. Tighten the steering ball joint nuts to a torque of 78 lbf.ft (106Nm).

   c. Check the wheel alignment, see operation 7C.1.

   d. Use new split pins when refitting the steering ball joints.

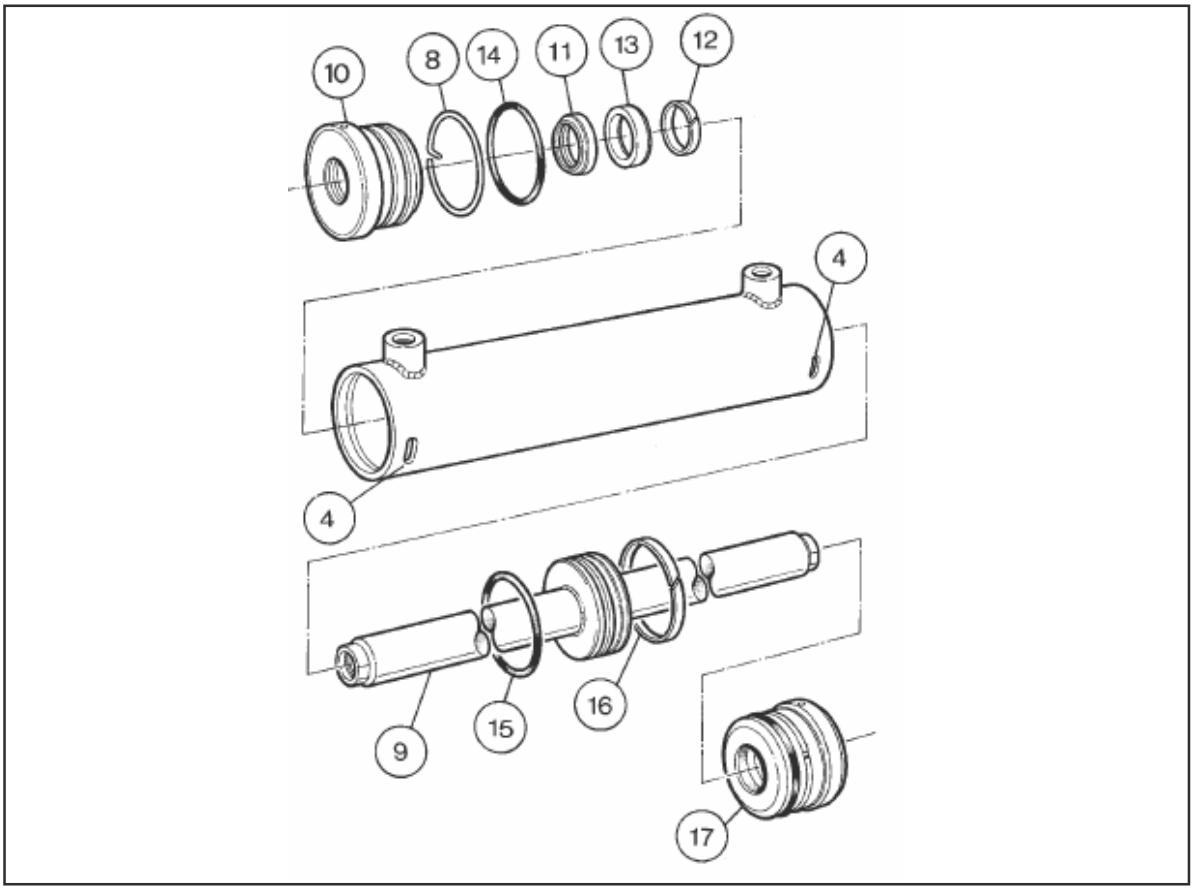

Fig 46

7C.15 STEERING RAM

Overhaul

Special Tools:

MF.482 Steering ram wrench

Dis-assembly

1. Remove the steering ram, see operation 7C.14.
2. Remove any sealing plugs and drain out any oil in the ram cylinder by moving the piston from one end of the cylinder to the other. Hold the cylinder over a container during this operation.
3. Hold the ram cylinder in a vice by one of the mounting bosses.
4. Remove the sealing compound in the elongated holes at each end of the cylinder.
5. Using special tool MF.482 steering ram wrench, engage the small end of the wrench in the two slots in the cap. Rotate the cap until the chamfered end of the retaining wire can be seen in the elongated hole.
6. With the aid of a screwdriver, turn the end cap and pry the end of the wire up out of the hole.
7. Continue turning the cap and wind the rest of the wire out through the hole.
8. The end of the wire has a right angle bend which locates in a hole in the groove of the end cap, remove the wire from the ram cylinder.
9. Withdraw the piston assembly from the ram cylinder with the end cap.
10. Remove the end cap.

11. Remove the wiper seal.
12. Remove the wear ring.
13. Remove the pressure seal.
14. Remove the 'O' ring.
15. Remove the piston seal.
16. Remove the piston wear ring.
17. Remove the end cap from the other end of the ram cylinder following procedures 5 to 14.

    Examination : Clean and inspect all parts, renew any that are worn or damaged. Renew all seals, wear rings and 'O' rings.

Re-assembly

18. Fit a new set of seals in one of the end caps and lubricate them with transmission oil.
19. Renew the seal and wear ring on the piston and lubricate.
20. Refit the piston to the ram cylinder and slide the cap down into the cylinder.
21. Using wrench MF.482 rotate the end cap until the hole in the wire groove is visible through the hole in the side of the ram cylinder.
22. Insert a new wire so that the bent end locates in the hole in the end cap. Ensure that the two grooves in the ram cylinder and end cap are in line.
23. Rotate the end cap so that it draws the wire round the end cap inside the ram cylinder. Rotate until all the wire is in the cylinder.
24. Seal the elongated hole in the ram cylinder with a non-setting type sealing compound. This sealing operation is important to prevent the ingress of water and the resultant rusting of the end cap and retaining wire.
25. Repeat the operations 20 to 24 for the other end cap.
26. Check that the piston rod moves up and down the ram cylinder correctly.
27. Refit the steering ram to the tractor.

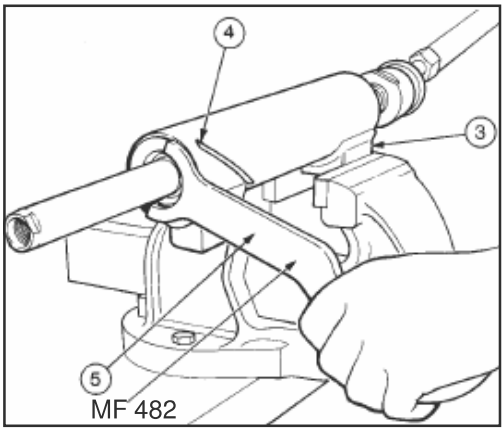

Fig 47

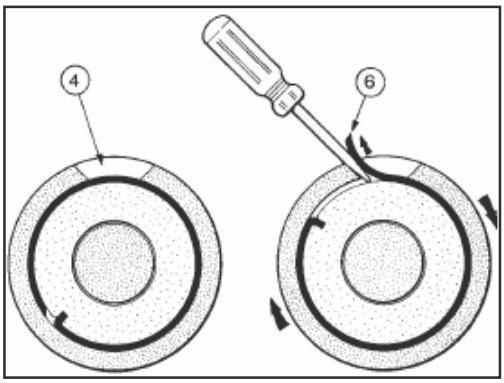

Fig 48

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